CLAIMS

What we claim is:

1. A method of cooling an electromagnetic stirrer used for stirring liquid metals, which comprises:

providing an assembly having an iron yoke with salient magnetic poles and electrical windings mounted on the magnetic poles and arranged in non-magnetic conductive housings filled with a dielectric ferrofluid, and

operating the electromagnetic stirrer to produce a magnetic field with substantial magnetic flux density gradients in the windings which produce a magnetic pressure in the ferrofluid which is at least sufficient to create a flow directed from the periphery to the inside of the winding.

2. The method of claim 1 wherein the ferrofluid has dielectric properties which correspond to an electrical resistivity of at least about 10^9 ohm•meters.

3. The method of claim 1 wherein the ferrofluid has magnetization saturation in the range of about 50 to about 200 Gauss and a Curie temperature of about 500° to about 300°C.

4. The method of claim 1 wherein the housings are constructed of non-magnetic stainless steel.

5. The method of claim 1 wherein grooves are provided on both the internal and external walls of the winding enclosure to facilitate ferrofluid flow from the inside and cooling water from the outside of the enclosure.

6. The method of claim 1 wherein the liquid metal is steel.

7. In a method of cooling an electromagnetic stirrer used for stirring liquid metal, the improvement which comprises cooling electrical windings using a dielectric ferrofluid.

8. An electromagnetic stirrer, comprising:

a cylindrical housing having an axial mold tube for receiving molten metal,

an inner wall spaced from the mold tube and defining a cooling water flow channel,

an electromagnetic stirring assembly surrounding the inner wall and spaced therefrom and from an outer wall, said stirring assembly comprising a yoke, a plurality of magnetic poles and electrical windings mounted on each of the magnetic

poles, said plurality of magnetic poles and said electrical windings mounted on the magnetic poles being located in enclosed non-magnetic heat conductive housings filled with dielectric ferrofluid,

an annular wall dividing said cylindrical housing into a larger lower chamber in which are located said enclosed non-magnetic heat conductive housings and a smaller upper chamber, said inner wall defining having an inlet to said cooling water flow channel in fluid flow communication with the lower end of said lower chamber and an outlet from said cooling water flow channel in fluid flow communication with the upper end of said upper chamber,

a cooling water inlet in fluid flow communication with the upper end of said lower chamber and a cooling water outlet in fluid flow communication with said upper chamber.

9. The electromagnetic stirring of claim 8 wherein, in said housings, grooves are provided on the inner side of the front and rear walls thereof to facilitate the flow of ferrofluid within the housings.